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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/713,242	11/16/2000	Andrew J. Shields	199866US2CRL	3249
22850	7590	11/21/2003	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			MONBLEAU, DAVIENNE N	
			ART UNIT	PAPER NUMBER
			2878	

DATE MAILED: 11/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/713,242	SHIELDS ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Davienne Monbleau	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 18 August 2003.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-55 is/are pending in the application.
- 4a) Of the above claim(s) 35 and 37-55 is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-34 and 36 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 16 November 2000 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. §§ 119 and 120

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) All b) Some \* c) None of:  
1. Certified copies of the priority documents have been received.  
2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) The translation of the foreign language provisional application has been received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

#### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                    | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                           | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>6-8</u> . | 6) <input type="checkbox"/> Other: _____ .                                   |

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election with traverse of Group I, Species I, Claims 1-34 and 36 in Paper No. 12 is acknowledged. The traversal is on the ground(s) that the Species identified in the restriction correspond to Figures 2 and 22 and not to Figures 2 and 17. (See Applicant's remarks on pages 13-14). Examiner agrees with the traversal argument that the Species identified correspond to Figures 2 and 22.

The requirement is still deemed proper and is therefore made FINAL.

Therefore, Applicant's election of Group I, Species I (Figure 2), claims 1-34 and 36 is considered valid.

### ***Response to Amendment***

The amendment filed on 8/11/03 has been entered. Claims 2-4, 17-22, 30,33 and 34 have been amended. Claims 1-55 are pending. Claims 35 and 37-55 have been withdrawn from consideration. An action on the merits for Claims 1-34 and 36 follows.

### ***Information Disclosure Statement***

The IDS filed on 12/12/01, 7/3/02, and 12/6/02 have been acknowledged and a signed copy of each PTO-1449 is attached herein.

### ***Specification***

The words "polarisation" and "polariser" are consistently misspelled throughout the specification.

*Drawings*

Many of the drawings are not positioned within the required spacing on the pages and thus have the Figure numbers missing.

*Claim Objections*

Regarding Claim 31, there is insufficient antecedent basis for “the wavelength of the fibre optic cable” and “the cavity mode”.

Claims 11 and 34: the word “polarisation” should be changed to -- polarization --.

Claim 34: the word “polariser” should be changed to -- polarizer --.

*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-11, 17, 18 and 36 are rejected under 35 U.S.C. 102(b) as being anticipated by Applicant's cited prior art Molotov et al. (“Quantum Cryptography Based on Quantum Dots”).

Regarding Claims 1 and 36, Molotov et al. disclose in Figure 1a and on page 688 a photon source comprising a quantum dot having a first confined energy level (valence band) and a second confined energy level (conduction band) and supply means (circular polarized photon) for supplying carriers to the said energy levels, wherein the supply means are configured to supply a predetermined number of carriers to at least one of the energy levels to allow recombination of a predetermined number of carries in said quantum dot to emit at least one photon.

Regarding Claim 17, Molotov et al. disclose on page 688 a supply means (circular polarized photon) and it is inherent that said supply means could also be applied to the other energy level.

Regarding Claims 2, 3 and 5, Molotov et al. disclose on page 688, 3<sup>rd</sup> and 4<sup>th</sup> paragraphs the typical radiative recombination times and that the supply means needs to be controlled according in order to allow a single photon to be emitted. This enables predetermining the number of carriers to be injected, the time required to allow a certain amount of photons to be emitted, and the number of radiative recombinations that are possible within a given time frame.

Regarding Claim 4, Molotov et al. disclose in Figure 2a that a plurality of quantum dots may be used.

Regarding Claim 6, Molotov et al. disclose on page 688, 4<sup>th</sup> paragraph line 3 that the supply means comprises pulsed radiation.

Regarding Claims 7-9, Molotov et al. disclose on page 688, 4<sup>th</sup> paragraph that the pulse has a duration less than the relaxation time of a carrier which it excites in the quantum dot. This ensures the separation of the stimulated photon emission.

Regarding Claim 10, it is inherent that the radiation has an energy substantially equal to that of the quantum dot transition energy in order to excite the electron and hole to recombine and produce the photon emission.

Regarding Claim 11, Molotov et al. disclose in Figure 1a that the incident radiation has a predetermined polarization (circular).

Regarding Claim 18, it is inherent for recombination that injected carriers into one energy level have the energy of the other energy level; this allows for the transition.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's cited prior art Molotov et al. ("Quantum Cryptography Based on Quantum Dots") in view of Frazier et al. (US 5,646,418).

Regarding Claim 12, Molotov et al. do not teach modulation means. Frazier et al. teach in the abstract modulations means. It would have been obvious to one of ordinary skill in the art at the time of the invention to use modulation means in Molotov et al., as taught by Frazier et al., to provide a three-terminal switching device. (See Frazier et al. column 2 lines 15-20).

Regarding Claim 13, Frazier et al. teach in claim 12 that said modulating means comprises varying an electric field, which is done by applying a voltage.

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Regarding Claim 14, Frazier et al. teach in the abstract modulating the energy for the conduction band in quantum well, which will affect the carrier density for the photon source.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's cited prior art Molotov et al. ("Quantum Cryptography Based on Quantum Dots") in view of Fafard et al. (US 6,239,449). Molotov et al. do not teach barrier layer. Fafard et al. teach in Figure 1 a semiconductor device comprising a doped barrier layer (12) and a quantum dot layer (14). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a doped barrier layer in Molotov et al., as taught by Fafard et al., to provide carriers to the quantum dot layer. (See Fafard et al. column 4 lines 65-67).

Claims 19, 21, 30 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's cited prior art Molotov et al. ("Quantum Cryptography Based on Quantum Dots") in view of Crow (US 5,423,798).

Regarding Claim 19, it is inherent that the photon source has an output surface but Molotov et al. do not teach coupling means including a fiber optic. Crow teach in Figure 4 the output of a light source (the light transmitted through element 36) coupled to a fiber optic cable (42). It would have been obvious to one of ordinary skill in the art at the time of the invention to use couple the output into a fiber optic cable in Molotov et al., as taught by Crow, to use the source in a communications system.

Regarding Claim 21, Molotov et al. do not teach a lens. Crow teach in Figure 3 that the output of a light source (12) is collected in a lens (16). (42). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a lens in Molotov et al., as taught by Crow, because lenses are standard in the art to collect and focus output light.

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Regarding Claim 30, Molotov et al. do not teach coupling means including a fiber optic. Crow teach in Figure 4 the output of a light source (the light transmitted through element 36) coupled to a fiber optic cable (42). It would have been obvious to one of ordinary skill in the art at the time of the invention to use couple the output into a fiber optic cable in Molotov et al., as taught by Crow, to use the source in a communications system.

Regarding Claim 32, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the a non-reflective coating on the fiber in order to maintain the output wavelength of the light source. Reflection inside said fiber may cause amplification and alter the output light.

Regarding Claim 33, Molotov et al. do not teach a filter. Crow teaches in Figure 4 various optical elements to achieve a specific output beam, but do not specifically teach a filter. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a filter in Molotov et al. to select a desired output wavelength (or to select any other feature) for the output beam. Filters are well known and commonly used in the art.

Regarding Claim 34, Molotov et al. do not teach a polarizer. Crow teaches in Figure 4 a polarizer (30). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polarizer in Molotov et al., as taught by Crow, to select a desired output polarization for particular communication purposes.

Claims 20 and 22-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's cited prior art Molotov et al. ("Quantum Cryptography Based on Quantum Dots") in view of Sugiyama (US 6,177,684).

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Regarding Claim 22, Molotov et al. do not teach a mirror cavity. Sugiyama teach in figure 7 and in column 10 lines 34-43 a mirror cavity having a mirror (M and AR) located on opposing sides of a quantum dot (26b). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a mirror cavity in Molotov et al., as taught by Sugiyama, to form an optical cavity as usual in a laser diode to produce an amplified optical beam.

Regarding Claims 20 and 23, Sugiyama teaches an output surface (the right side of the device) and said mirror closest to said output surface is partially reflective (AR coating).

Regarding Claim 24, it is well known in the art that the energy of the cavity mode is substantially equal to the optical output beam because the energy of the cavity mode determines in effect the energy of the output beam.

Regarding Claim 25, it is well known in the art that the length of a cavity affects the output wavelength of the optical beam. Therefore, choosing a specific distance between the two mirrors to achieve a desired result involves routine skill in the art.

Regarding Claim 26, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a specific spectral band-pass of the cavity since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding Claim 27, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a place the quantum dot at a specific location within the standing wave pattern of the mirrors since it has been held that discovering an optimum value of a result

effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's cited prior art Molotov et al. ("Quantum Cryptography Based on Quantum Dots") in view of Sugiyama (US 6,177,684), as applied to Claim 22 above, and in further view of Cho et al. (US 5,314,838).

Regarding Claim 28, Molotov et al. do not teach a Bragg mirror. Cho et al. teach in Figure 1 laser comprising a mirror cavity with a Bragg mirror (70) with alternating layers. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a Bragg mirror in Molotov et al., as taught by Cho et al., as they are standard in the art for creating suitable resonant cavities for lasers.

Regarding Claim 29, Molotov et al. do not teach a mirror comprising a metal layer and a phase matching layer. Cho et al. teach in column 2 lines 1-7 and in Figure 3 that a mirror may comprise a metal layer and a phase matching layer (80). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a metal layer and a phase matching layer in Molotov et al., as taught by Cho et al., to enhance the reflectivity of a metalized reflective surface and to enhance the constructive interference between reflected light, respectively.

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant's cited prior art Molotov et al. ("Quantum Cryptography Based on Quantum Dots") in view of Sugiyama (US 6,177,684), as applied to Claim 22 above, and in further view of Crow (US 5,423,798). Molotov et al. do not teach a fiber optic cable. Crow teach in Figure 4 the output of

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a light source (the light transmitted through element 36) coupled to a fiber optic cable (42). It would have been obvious to one of ordinary skill in the art at the time of the invention to use couple the output into a fiber optic cable in Molotov et al., as taught by Crow, to use the source in a communications system. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have the wavelength of the fiber equal to that of the cavity mode in order to maintain the output wavelength of the light source.

*Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 6,369,403; US 5,953,356; US 6,541,788; and JP 11074608.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Davienne Monbleau whose telephone number is 703-306-5803. The examiner can normally be reached on Mon-Fri 9:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on 703-308-4852. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Davienne Monbleau

DNM



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